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ABSTRACT

In 1987, the Arizona legislature began a process of establishing statewide goals for the improvement of the state's educational system. A joint legislative committee developed specific goals in the areas of student achievement, high school graduation rate, and postschool employment and college enrollment. To produce the baseline data necessary in measuring the progress toward these goals, S.B. 1234 (1989) required the Department of Education to develop a comprehensive student assessment plan. The Department of Education contracted with the Morrison Institute for Public Policy to provide research related to this mandate. This document examines student identification, followup, tracking, and information systems for the purpose of assisting the Department of Education in its compliance with S.B. 1234. This research, coupled with information collected on these new systems across the nation, serves as the basis for six recommendations: (1) The terminology used in S.B. 1234 (1989) must be clarified; (2) a formal state-level task force should be established; (3) the state should use Social Security numbers as the uniform student identifiers; (4) the task force should follow six specific recommendations made by Morrison; (5) state-level funding should be used for the information system; and (6) the state should take all measures possible to ensure the privacy and confidentiality of all student information. (106 references) (LAP)

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IT'S 1990:
Do You Know
Where Your Students Are?

A National Review of Student Data Systems

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June 1990

EXECUTIVE SUMMARY

Background

In 1987, the Arizona legislature began a process of establishing statewide goals for the improvement of the state's educational system. A joint legislative committee developed specific goals in the areas of student achievement, high school graduation rate, and post-school employment and college enrollment, which were enacted into law through S.B. 1327 (1988). Recognizing that Arizona lacked the baseline data necessary to measure progress toward these goals, S.B. 1234 (1989) required the Department of Education to develop a comprehensive student assessment plan as the first step in the implementation of statewide goals.

As part of the comprehensive student assessment plan, the Department was charged to work with the Arizona Board of Regents and the Arizona State Board of Directors for Community Colleges to "develop a system for collection of data to provide information on progress toward the post-school employment and college enrollment goal." The Department of Education contracted with the Morrison Institute for Public Policy to provide research related to this mandate. Three primary research tasks were undertaken by Morrison Institute: 1) A series of schematics depicting the general flow of student tracking/information systems were developed and presented to the Department in March, 1990; 2) a synopsis of student data systems within Arizona was compiled in a document entitled *"Does Arizona Know Where Its Students Are? Status of Student Data Systems in Arizona"* (June, 1990); and 3) a national overview of local, state, and national student data systems was completed and is presented in this report.

Research Methodology and Common Terminology

The Morrison Institute study of student data systems examined information from all 50 states but emphasized states identified as leaders in the implementation of such systems. In addition to document analysis, Morrison Institute researchers interviewed more than 60 individuals in 28 states from December 1989 through May 1990. The focus of the research was upon K-12 systems and systems following students from high school into higher education or employment, although selected post-secondary systems were also studied.

One concern became apparent early in the research–the lack of common terminology to describe the various types of student data systems. Due in part to this confusion, the intent and scope of the legislative mandate was unclear. Communication among personnel from various Arizona institutions frequently was also unclear since different terms were utilized to describe the same systems. To overcome this problem, working definitions for the four primary types of student data systems–student identification, follow-up, tracking, and information systems–were developed and the structure of this document was built around these systems. Distinguishing characteristics for each system are listed below; a complete definition appears as an introduction to the section in this report that analyzes each system:

1. **student identification systems** - are characterized by unique student identification numbers assigned to all students.

2. **follow-up systems or studies** - follow a sample of students beyond an educational system.

3. **tracking systems** - using commonly defined data elements, tracks cohorts of students over time within an educational system.

4. **student information systems** - contain commonly-defined information on all students within an educational system, collected into student unit records. Student information systems are the largest in scope of all four types of student data systems.

For each of these four primary student data systems, a general description, purposes, implementation status of initiatives across the nation (including chart profiles with additional details within the appendices), and an explanation of advantages and disadvantages. The report also identifies key policy questions which Arizona needs to address as part of the decision-making process mandated by S.B. 1234 (1989). Finally, six recommendations are presented to assist the Department of Education in establishing a system which will meet the needs of Arizona's students, educational institutions, and policy makers.

Student Identification Systems

The primary component of a comprehensive student data system is the assignment of a unique student identification number to each student within the system. This document identifies the general purposes of such a system, highlights nine states which utilize a student identifier at the K-12 level, describes the primary design, and indicates implementation problems.

As mandated by S.B. 1234 (1989), Arizona must decide if a state-level student identification system is warranted. If the decision is affirmative, the report describes two primary options: using the student's social security number, or assigning each student a unique number. Should Arizona opt for a system using social security numbers, advantages would be to a wider range of information, consistency in numbering from kindergarten through post-baccalaureate education, lowered design costs, and a greater capability for tracking student information from one computerized system to another. Disadvantages would include public concern over information confidentiality and obtaining valid social security numbers for all students. By contrast, unique identification numbering systems would allow for greater customizing of information but would have more design problems and be less beneficial for tracking purposes.

Follow-up Studies and Systems

Follow-up studies or systems obtain information on what happens to a sample of students once they have left a system–a primary mandate of S.B. 1234 (1989). Follow-up studies are usually one-time data collection efforts, while follow-up systems are continuous, on-going efforts to establish exit information about students.

Both follow-up studies and systems use survey methodology and/or database matching to obtain information on students who have left an educational institution. Surveys involve the traditional process of contacting the students after they have left an educational system by phone and/or mail. Database matching pairs information from one database with another through "computers talking to computers." This document highlights the characteristics of 18 local, state, and national follow-up studies or systems which use survey methodology and examines eleven state follow-up studies or systems which use database matching.

The two means of collecting information about students who have left educational institutions–surveys and database matching–both have advantages and disadvantages. Surveys are best suited for collecting qualitative information such as perceptions and allow for the tailoring of specific questions. However, surveys have been plagued by low response rates and their effectiveness decreases drastically for longitudinal studies due to high student mobility. Lastly, follow-up mailings and telephone calls are expensive.

In contrast, database matching is less paper-and-personnel-intensive than surveys, thereby reducing the costs. It often provides more reliable quantitative employment information and works well for longitudinal follow-up systems since databases are usually maintained over time. However, the information contained within databases is often limited, and comparison between databases is hampered by inconsistent formatting and terminology. Lastly, privacy issues require complex arrangements with state or federal agencies and may require enabling legislation to allow matching.

Student Tracking Systems

Tracking systems monitor the longitudinal progression of cohorts within an education system—from grade to grade, school to school, district to district, and between educational levels—according to an established set of rules and procedures. While follow-up studies and systems focus totally upon students who have exited a system, student tracking systems focus on the student while they are still within the system. Eighteen local, state, national tracking systems and inter-level information exchanges are examined within this document from which analyses were drawn.

The major problem in implementing state-level tracking systems is the current multiplicity of unique institutional systems—each with its own record formats, types of computers, and data definitions. Arriving at a consensus on both optional and required data elements is also a complex issue. Advantages to establishing a state-level tracking system exist in that institutions would have a comprehensive information base on cohorts of students within their system which could evolve into a follow-up system when those students leave the system. Common data elements would allow the individual institutions and the state to compare behavior and performances of sub-groups of students, enabling better decision making.

Four options for establishing a coherent student tracking system are outlined in the paper: 1) establish a state-level unit record system; 2) collect data through common unit record information at the institutional level; 3) develop consortia of institutions; and 4) continue to maintain institutional systems.

Student Information Systems

Student information systems are the largest in scope of all student data systems. They allow for the organization of individual information on all students within an educational system into computerized student records. Student tracking and follow-up systems focus on targeted student cohorts, while student information systems include records of entire student populations.

Eight state-level K-12 and integrated student information systems are depicted, including legislative mandates and system characteristics. Additional information on 15 other local, state and national student information initiatives is presented in the appendix.

Technical problems, institutional resistance, student identification number decisions, information security concerns, inconsistent data definitions, and high costs represent the many disadvantages of implementing a state-level student information system. Advantages exist in that institutions would be able to transfer student records more efficiently; the state could know the whereabouts of all students, many of whom now slip between the cracks; and better access to information could improve decision-making both at the state and local level.

Essential Policy Questions for Decision-makers

The following six policy questions need to be addressed by all parties involved in the development of a student data system for Arizona, especially if the intent is to develop a comprehensive student information system. General analysis to assist the process is offered for each within this document:

1. What are the primary purposes of the system?
2. Should the system be mandatory or voluntary?
3. Should the system encompass all grade levels?
4. Should the system specify definitions of all or just selected data elements?
5. Should the system be integrated with other systems; e.g. staff and financial information?
6. Should control of the information be housed in a central mainframe computer on the state level or should it be controlled more at the local level with processing done at regional processing centers?

Recommendations

This document examines student identification, follow-up, tracking, and information systems for the purpose of assisting the Department of Education to comply with S.B. 1234 (1989). This research, coupled with information collected on the status of these systems across the nation and in Arizona, serves as the basis for the six general recommendations that follow:

1. The terminology used in S.B. 1234 (1989) must be clarified.
2. A formal state-level task force should be established to work towards fulfilling the requirements of S.B. 1234 (1989).
3. In designing a student identification system, it is recommended that the state use social security numbers as the uniform student identifier.
4. When designing the state-level student information system the task force should consider the following recommendations:
    A. The scope of the system should be limited and the purposes of the system clearly defined.
    B. The system should be mandatory.
    C. The system should encompass all grade levels, but must be realistically phased-in.
    D. A standardized state data dictionary should be developed.
    E. Initially, system design should be limited to student information only.

F. Information should be relayed to the state level at pre-determined intervals through regional processing centers. The system should be decentralized, with information control residing at the institutional level.

5. State-level funding should be secured to design, pilot, implement, and maintain the decentralized student information system. Funding should be provided for hardware and software acquisitions, as well as for technical and training support.

6. The state should take all measures possible to assure the privacy and confidentiality of all student information.

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INTRODUCTION[1]

Concern over the quality of education in the United States has translated into demands that education systems be held accountable for the caliber of their products–the students. Policymakers are no longer content with counting student enrollment. Now, they wish to know what students have learned and whether schools are effectively managing each student's education.

Several forces reflect the increased requests for better and more complete student information. Education must compete with other government services for dwindling funds. Given the fiscal constraints under which state governments now operate, legislators question the relationship between education funding and student participation in higher education, achievement, and employment outcomes. In particular, legislators are clamoring for accurate data about students with specific characteristics–e.g., minorities, at-risk students, dropouts, and vocational education students–for the purposes of planning and evaluating programs targeted towards these groups.

To some extent, the availability of technology also contributes to the "accountability movement." Recognizing that computers can be used for management, research, estimation, and modeling leads the public to believe that student information should be easily retrievable. For this reason, parents, students, educators, and government officials are frustrated by the lack of details available on student learning outcomes. Increasingly, legislatures are allocating more monies towards the technological improvements of state and local education systems for the purposes of improving both management efficacy and the quality of student information. As in other states, Arizona's desire for greater educational accountability produced a call for more and better student information.

Passed in 1989, Senate Bill (S.B.) 1234 established statewide goals for educational excellence in Arizona. As part of this bill, the Arizona Department of Education, in cooperation with the Arizona Board of Regents and the Arizona State Board of Directors for Community Colleges, is required to "develop a system for collection of data to provide information on progress toward the post-school employment and college enrollment goal." Consideration is to be given to "the use of a state student identification system to allow tracking of students as part of an assessment program." These components are to be part of a comprehensive assessment system which also is to measure progress in meeting the state goals for high school graduation and student achievement at grades 3, 8, and 12.

The Arizona Department of Education contracted with the Morrison Institute for Public Policy to provide research to assist the Department in meeting the mandates of S.B. 1234 (1989) related to the post-school employment and college enrollment goal. The primary research objective was to complete three aspects of this task: 1) develop a series of schematics to depict the general flow of a school tracking/information system;[2] 2) a national overview of local, state, and national student data systems, which is presented in this document; and 3) a review of the progress within Arizona in regard to these types of student data systems, which is contained in a

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1 Any item appearing in italics will be defined in a footnote in the section to which the term pertains. The definitions will be for the purposes of this document only.

2 This product was presented to the Arizona Department of Education in March 1990.

companion document produced by Morrison Institute entitled *"Does Arizona Know Where Its Students Are? Status of Student Data Systems in Arizona".*

This document highlights the characteristics, purposes, data elements, implementation status, design options, and implementation problems of student identification, follow-up, tracking, and information systems. As will be noted throughout the paper, these four systems used to collect information on students have subtle differences. A definition of the terms used to describe the four types of systems and a discussion of each system with examples from other states will be a primary focus of this manuscript. Recommendations as to the path Arizona might pursue in meeting the requirements of S.B. 1234 (1989) are also included.

RESEARCH METHODOLOGY

The Morrison Institute study of *student data systems*[3] examined information from all 50 states but emphasized states identified as leaders in the implementation of student identification, follow-up, tracking or information systems. The focus of the research was upon K-12 systems and systems following students from high school into higher education or employment, although selected post-secondary systems were also studied.

As part of the investigation, Morrison Institute researchers interviewed more than 60 individuals in 28 states from December 1989 through May 1990.[4] Key personnel contacted by telephone included staff from:

- planning and evaluation, research and testing, student information systems, and/or vocational education divisions of state departments of education;
- state unemployment divisions and state occupational information coordinating committees;
- university and community college institutional research offices;
- post-secondary education governing bodies; and
- national organizations, e.g. Council of Chief State School Officers, and the National Center for Education Statistics.

Materials obtained directly from the 28 states were also reviewed. In addition, Morrison Institute conducted a search of Educational Research Information Clearinghouse (ERIC) documents published since 1984.

In the course of the research, several limitations became apparent. Because many of the student data systems were newly implemented or in pilot stages, information available was often minimal. Identification of the key individuals in each state who might have appropriate information on student data systems was difficult, thus the most knowledgeable person in the state may not have been interviewed. A final concern was the lack of consistent definitions and terminology.

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3 ***student data systems*** - systems that contain information about individual students. For the purposes of this paper, student data systems will refer to student identification systems, student follow-up systems, student tracking systems, and student information systems.

4 Names of persons interviewed and materials referenced are found in the reference section beginning on page 47.

STUDENT DATA SYSTEMS - COMMON TERMINOLOGY

During the interviews, it became apparent that a variety of terms were used to describe similar systems. Since this document is intended to help the Department of Education develop a student data system which may involve vast numbers of individuals and institutions, a major focus was to establish common terminology for use by all participants in the project.

In an attempt to distinguish each of the four primary types of student data systems–student identification, follow-up, tracking, and information systems–working definitions were developed, and the structure of this document was built around these four systems. Since the distinctions are not always discrete, the primary characteristic for each system is listed below while a complete definition appears as an introduction to the section which describes that system:

1. **student identification systems** - are characterized by unique student identification numbers assigned to all students.

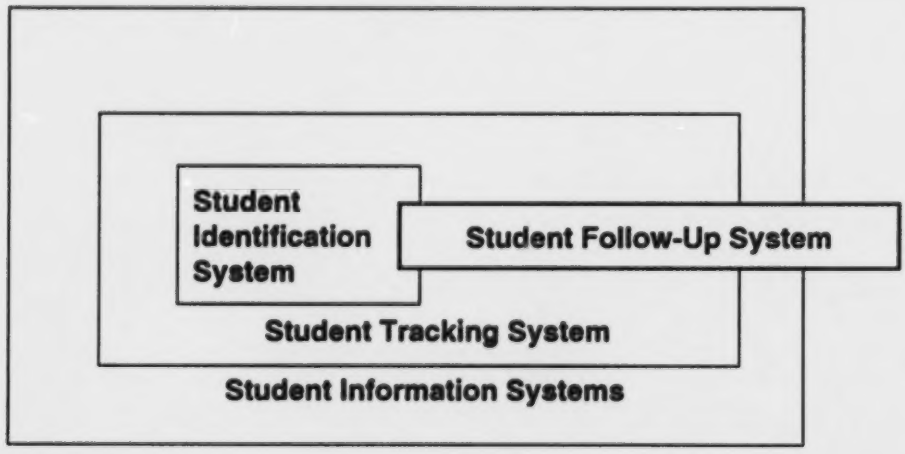
2. **follow-up systems or studies** - follow a sample of students beyond an educational system.

3. **tracking systems** - using commonly-defined data elements track *cohorts*[5] of students over time within an educational system.

4. **student information systems** - contain commonly-defined information on all students within an educational system, collected into student unit records. Student information systems are the largest in scope of all the types of student data systems.

Figure 1 demonstrates the most common relationship among the different types of systems. Student identification and tracking systems are often subsumed within larger student information systems. Follow-up systems have the potential to be a part of the other three. While figure 1 illustrates the most common type of relationship, each of the four systems has stand-alone potential. A state-level student identification system could be designed without establishing a

Figure 1



5 *cohorts* - a group of individuals with shared characteristics; e.g., year of enrollment, age, or ethnicity.

state-level student information system. A state-level tracking system could be initiated without instituting a follow-up system. However, it is very unlikely that either a state-level student tracking or student information system would ever be implemented without first having a state-level student identification system.

When making initial decisions regarding the appropriate system(s) for Arizona to implement in response to S.B. 1234 (1989), it is important to better understand the distinctions among the various types of student data systems and their relationships. The next sections of this document will examine each system in detail, offering illustrations and examples from across the nation.

STUDENT IDENTIFICATION SYSTEMS

> ***student identification system*: processes whereby each student is assigned a unique number according to a pre-defined set of rules and principles.**

Description and Purposes of Student Indentification Systems

There are two models of student identification systems: those that use social security numbers and those that use assigned student numbers. Community colleges and universities most frequently use social security numbers. K-12 institutions most often use seven to twelve digit assigned or computer-generated numbers.

For those systems not using social security numbers as identification numbers and for those students whose social security numbers are unavailable, alternate number assignment procedures are generally laid out in great detail. The coding format of the student identification number is highly specified as to length, field position within the student record, and school location information. Also enumerated are the documents on which the student identification numbers are to appear; e.g., entry and exit papers, transcripts, permanent records, test results, and college admissions applications. These numbers are most often assigned permanently upon a student's initial entry into school.

Unique student numbers enable the organization of all information about an individual student into a single record. Without a commonality in numbering schemes, information about an individual student can be lost as a student transfers between schools and progresses through an education system. In a sense, state-level student identification systems are often precursors to state-level student tracking, database matching follow-up systems, and student information systems. Without uniform numbering systems, the ability to track students, follow them beyond high school and aggregate or disaggregate information for analysis is limited.

Implementation Status of Student Identification Systems

While numerous student identification systems exist on institutional levels, the focus of the Morrison Institute study was on state-level systems. Table 1 summarizes the state-level identification systems identified in the course of the study. To date, no state has fully implemented a uniform student identification system encompassing kindergarten through graduate education.

Table 1
State Level Student Identification Systems

Identifier Used	States, Education Level, Year of Implementation
Social security number	***K-12:*** North Carolina (1984), Texas (1990) ***Postsecondary:*** Colorado, Connecticut, Florida, Georgia, Maryland (1976), Minnesota (1983), Oklahoma (1980), Tennessee (1981), Texas
Unique identification number	***K-12:*** Florida (1987),* Georgia (1979), New York (1990), South Carolina (1980), Utah (1984), Virginia (1990), Washington (1979)
*Although Florida uses unique identification numbers on the K-12 level, there is a field in the student record for a social security number. The K-12 Florida student number is also required on all college and university applications.	

Student Identification Systems–Design and Implementation Problems

The relatively small number of states that have executed state-level student identification systems can be attributed to several factors. Consensus as to the structure and format of a state student identification number is difficult to achieve, given the myriad of local school systems in existence–each using its own numbering systems.

Because of the multiplicity of local systems, costs of designing and implementing state-level systems are often high. For example, a 1986 study gauged that implementation of a statewide uniform student identification system for over five million California students might cost between $673,000 and $911,000, with annual operating costs of almost $400,000. (7)

Another reason for the slow implementation of student identification systems has been confusion regarding which identification system to use–social security number or assigned number. While social security numbers seem a logical option for a student identification system, there has been a reluctance to use this number because of the perception that privacy and confidentiality of individuals could potentially be compromised. However, legal analyses have revealed that if states obtain consent for use of any collected information or guarantee anonymity by using such information in aggregate form, using social security numbers is not legally a problem.[6](42)

Student Identification System Options

As mandated by S.B. 1234 (1989), Arizona must decide if a state-level student identification system is warranted. Should Arizona opt for a system using social security numbers, advantages

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6 Certain conditions must be met in order for use of social security numbers to be legal. Submission must be on a voluntary basis. Consent must either be obtained or the information used as "aggregate statistical data without any personal identifiers."

would be access to a wider range of information, consistency in numbering from kindergarten through post-baccalaureate education, lower design costs, and a greater capability for tracking student information from one computerized system to another. Disadvantages would include public concern over information confidentiality and obtaining valid social security numbers for all students.[7] Unique identification numbering systems would allow for greater customizing of information but would have more design problems and be less beneficial for tracking purposes. Table 2 recapitulates the advantages and disadvantages of each type of student identification system.

Table 2
Pros and Cons of Student Identification Systems

	Advantages	Disadvantages
Social security number	• Access to state and national databases • Already used on post-secondary level • Easily memorized • Every child will be required to have one • Lower administrative costs because design and implementation of numbering system would be minimal	• Concern with security/confidentiality of information • Not uniformly available • Requires passage of legislation to ensure confidentiality of information • Submission is currently voluntary only; would need federal legislation change to make mandatory • Undocumented aliens and others who are concerned they may be identified through social security numbers might not send children to school • Hard to verify validity of number
Unique identifier	• Ability to build in sub-identification codes, e.g., school location, address • Less appearance of "Big Brother"	• Could result in duplication of numbers • Hard to track past high school • Permanency of number issued--how long to wait before reactivating number once student leaves system • If implemented on a statewide basis, would need enabling legislation or a state board of education rule requiring the use of the number

7 Federal law states that submission of social security numbers is voluntary.

FOLLOW-UP STUDIES AND SYSTEMS

> ***follow-up study:*** **processes involving surveys or database matching whereby students are followed beyond an educational system or training program, usually as a single data collection effort.**
>
> ***follow-up system:*** **processes involving surveys or database matching whereby students are followed beyond an educational system or training program, using established rules and procedures for ongoing collection of information.**

In addition to finding a way to identify individual student records, states are interested in what happens to students who have dropped out or received a diploma, certificate, or degree. Follow-up studies are usually one-time data collection efforts to determine what happens to students who have left school–whether they enroll in higher education, enter the labor force, or join the military. In contrast, follow-up systems are continuous, ongoing attempts to establish exit information about students.

Follow-up studies and systems most often use survey methodology and/or database matching to answer questions about the impact an educational system may have upon students. The advantages and disadvantages of survey methodology versus database matching will be examined, subsequent to a brief description of the characteristics, purposes, and types of information collected through each method.

Follow-Up Surveys–Description, Purposes, and Types of Information Collected

Over the last twenty years, the federal government and numerous states and localities have conducted *follow-up surveys*[8] of students, employers, educators, and parents. In some cases, surveys were prompted by legislative requirements; e.g. compliance with federal statutes mandating information about vocational completers and leavers. In other instances, surveys were undertaken for the purposes of program or institutional evaluation and planning.

Many types of student follow-up data are collected through surveys. An individual student's sex, ethnicity, training program, full or part-time community college or university enrollment, full or part-time employment status, wages earned, and employment in a field related to training are among the types of information gathered by surveys. Feedback information about individual programs–i.e., ratings of the quality of academic or vocational preparation received and changes that might be made to improve school experiences–are also obtained from employer and student surveys. Comparative data–between actual and projected educational goals or contrasts among students with different educational backgrounds–are also extracted from surveys.

Follow-Up Surveys–System Characteristics and Implementation Status

Table 3 highlights the characteristics of 18 local, state, and national follow-up studies or systems using survey methodology as identified through a search of Education Research Information Clearinghouse (ERIC) documents from 1984 through 1990. More details about the eighteen studies and systems featured in Table 3 can be found in Appendix A.

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8 *follow-up surveys* - collecting information by questionnaire.

Among the commonalities in the studies and systems featured in Table 3 were:

- All of them surveyed students.
- Sampling was the most common selection method.
- Most used mail surveys, supplemented by follow-up mailings or telephone calls.
- The majority collected information within one year after a student had left the educational system.
- Most used schools or districts as the agents conducting the surveys.
- The majority (16 out of 18) examined all students exiting an educational system; e.g. general track, general education diploma (GED), and vocational. The remaining two studies/systems focused upon vocational education completers or leavers.

Table 3
Follow-Up Studies and Systems: Surveys

	Studies									Systems								
	Local		State					National		Local	State							
Features	San Diego, CA	Sandy Union, OR	California	California	Florida	Oregon	Wisconsin	High school and beyond	National Education Longitudinal Study	Rochester, NY	Connecticut	Delaware	Hawaii	Iowa	Minnesota	Missouri	South Carolina	Wisconsin
Population Surveyed:																		
Students	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Educators								✓	✓									✓
Employers							✓							✓				✓
Parents								✓	✓									
Selection Method:																		
Sampling	✓		✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	
Total Population		✓									✓	✓						✓

Table 3 (Con't)
Follow-Up Studies and Systems: Surveys

	Studies									Systems								
	Local		State					National		Local	State							
Features	San Diego, CA	Sandy Union, OR	California	California	Florida	Oregon	Wisconsin	High school and beyond	National Education Longitudinal Study	Rochester, NY	Connecticut	Delaware	Hawaii	Iowa	Minnesota	Missouri	South Carolina	Wisconsin
Survey Method:																		
Mail	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
Telephone					✓	✓											✓	
Follow-Up Mailings/Calls	✓			✓				✓	✓	✓		✓		✓	✓		✓	
Collection Agent:																		
District	✓	✓						✓	✓	✓		✓					✓	
State Department			✓		✓						✓		✓	✓		✓		✓
Other				✓		✓	✓					✓	✓		✓	✓		
Data Collected After:*																		
6 months	✓						✓			✓	✓	✓	✓					✓
1 year		✓	✓	✓	✓		✓							✓	✓	✓	✓	
2 years	✓		✓	✓			✓	✓	✓							✓		
3 years		✓	✓	✓		✓	✓									✓		
4 years			✓					✓	✓							✓		
5 years		✓	✓													✓		✓
6 years								✓	✓									
8 years									✓									
10 years									✓									✓

*Months/years after a student has left the system.

Table 3 (Con't)
Follow-Up Studies and Systems: Surveys

	Studies									Systems								
	Local		State					National		Local	State							
Features	San Diego, CA	Sandy Union, OR	California	California	Florida	Oregon	Wisconsin	High school and beyond	National Education Longitudinal Study	Rochester, NY	Connecticut	Delaware	Hawaii	Iowa	Minnesota	Missouri	South Carolina	Wisconsin
Students Studied:																		
All	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Vocational Education				✓										✓				
Types of Information																		
Demographic	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓		✓			✓	✓
Education Outcomes	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Employment Outcomes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Perceptions/ Opinions	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
Goals			✓		✓	✓		✓	✓						✓			
Miscellaneous*			✓	✓			✓			✓		✓				✓		✓
Conducted as:*										A	A	A	3	A	A	A	A	A
Response Rate(%)†	74	92	35	49	97	30	32	90	-	82	-	62	45	31	-	70	-	88

*Special needs, eligibility for college enrollment, training program.
**"A" means annual. "3" means conducted every 3 years.
†Response rate for the given year/years for which the program information was reviewed.

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- Most collected some demographic information and information about higher education and employment outcomes.
- Response rates were not consistent among either follow-up studies or follow-up systems.
- Comprehensive follow-up systems were more likely to survey total populations than were follow-up studies.
- The amount of time elapsed between the time a student left a system and the time that student was surveyed varied. Two of the follow-up studies were single survey efforts, with data collected from 6 months to 3 years after graduation. Seven of the follow-up studies were longitudinal, with information collected from 6 months to 10 years.
- Follow-up systems most often collected information six months or one year subsequent to a student's leaving school. With the exception of Hawaii–which collects information every 3 years–most systems collected information on an annual basis.
- Perceptual and goal-orientation information was more likely to be collected in a follow-up study than in a follow-up system.

Database Matching–Description, Purposes, and Types of Information Collected

In addition to survey methodology, other states use existing databases–e.g., unemployment insurance, income tax, military, and university enrollment records–to collect information on student employment and education-related outcomes. *Database matching*[9] is a way of pairing information from one database with another through "computers talking to computers." Information stored on magnetic tapes is "matched" using a common linking number, usually a social security number. In some cases, special computer programs are written to enable comparisons of data between databases with different formats.

Database matching follow-up studies and systems are used most often to produce employment histories of former students–e.g., a student's industry of employment, size of the firm in which they are employed, changes in wages, work location, number of weeks worked, and whether a student has worked more than one job. These studies or systems are often initiated for the purpose of determining the placement, completion, or wage rates of targeted groups of students–e.g. vocational education students, women, minorities, economically disadvantaged, or handicapped–who have graduated from specific types of training programs. In addition to program planning and evaluation, database matching is used for the purpose of trend analysis–to predict occupational supply and demand, learn about college enrollment patterns, and determine job mobility within a state. In some cases, information on college enrollment, types of college courses taken, and the relationship of college majors to previous studies are available by matching high school records with university or community college files.

Database Matching–System Characteristics and Implementation Status

Appendix B contains detailed information about the database matching studies and systems analyzed by Morrison Institute. For example, Colorado has started longitudinally tracking

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9 ***database matching follow-up systems*** - a system that uses a unique student identifier, e.g. a social security number, to match individual student records with information occurring in one or more other databases. Information obtained from the multiple databases is extracted and placed in a new, combined student record file. The U.S. Office of Management and Budget defines matching as "computerized procedures used to ... compare two or more automated systems of records or a system of records with a set of non-federal records to find individuals who are common to more than one system or set."(15)

community college graduates by matching community college records with university enrollment and unemployment insurance records. Florida is the only state with a state-supported ongoing database matching follow-up system which matches student records with university enrollment files, state employment records, unemployment insurance records both in and out-of-state, and civilian and military federal personnel files.

Table 4 summarizes the eleven database matching follow-up studies/systems analyzed for this study. Common characteristics of both database matching studies and database matching systems extracted from Table 4 include:

- The populations followed were mostly individuals who had participated in occupational training programs.
- The majority of individuals studied were on the post-secondary level. Secondary vocational education students were the only students pursued from the high school level.
- Most database matching studies/systems used unemployment insurance records.
- All database matching studies/systems collected wage information.
- The eleven database matching studies/systems examined by Morrison Institute found between 58% and 100% of their targeted populations.
- All of the database matching studies/systems were initiated since 1983. Five of them were started since 1989.
- Costs varied widely, depending upon the number of individuals followed.
- Database matching systems were administered primarily by state employment divisions. In contrast, database matching studies were mostly undertaken by consultants or universities.
- Most of the database matching follow-up systems were longitudinal in nature.
- Only three database matching systems were mandated by state law.

Table 4
State Follow-Up Studies and Systems: Database Matching

	Studies					Systems					
Characteristics	**Arizona**	**California**	**Ohio**	**Texas**	**Wisconsin**	**Alaska**	**Colorado**	**Florida**	**Maryland**	**Oregon**	**Utah**
Population Followed:*											
Secondary Vocational Education		✓	✓					✓	✓		
Postsecondary Vocational Education	✓		✓		✓			✓	✓	✓	✓
Community College				✓			✓	✓		✓	✓
Job Training Partnership Act (JTPA)				✓				✓	✓	✓	✓
Miscellaneous**						✓		✓	✓		✓
State Mandates	No	No	No	No	No	Yes	No	Yes	No	Yes	No
Study/System Starting Date	1985	1983	1987	1988	1989	1986	1989	1984	1990	1990	1990
Costs† (thousands)	70	-	50	-	50	320	-	317	100	130	10
Data Collected After:‡											
6 months							✓	✓			
1 year	✓			✓		✓	✓	✓	✓	✓	✓
2 years				✓	✓		✓		✓	✓	✓
3 years		✓					✓		✓	✓	✓
4 years		✓	✓						✓		
5 years		✓	✓		✓						

*Students who have left a training or education system.
**E.g., state residents, dropout prevention, adult education, corrections, high school graduates, training programs.
†For studies, costs refer to total study costs. For systems, costs refer to annual appropriations or operating costs.
‡Months/years after a student has left a training or education system.

Table 4 (Con't)
State Follow-up Studies and Systems: Database Matching

	Studies					Systems					
Characteristics	**Arizona**	**California**	**Ohio**	**Texas**	**Wisconsin**	**Alaska**	**Colorado**	**Florida**	**Maryland**	**Oregon**	**Utah**
Number of Subjects (thousands)*	17	-	42	20	16	310	4	195	100	2	11
Types of Information:											
Demographic	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Family					✓						
Institution:							✓	✓			
Financial					✓						
Course								✓			
Completion	✓				✓		✓			✓	✓
Vocational	✓		✓		✓			✓		✓	✓
Special Program								✓	✓	✓	
Employment:											
Occupation						✓		✓			
Wages	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Location			✓		✓	✓		✓		✓	
Military								✓			
Status	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

*For studies, refers to number of subjects studied. For system, refers to number of subjects followed on a one-year basis

Table 4 (Con't)
State Follow-up Studies and Systems: Database Matching

	Studies					Systems					
Characteristics	**Arizona**	**California**	**Ohio**	**Texas**	**Wisconsin**	**Alaska**	**Colorado**	**Florida**	**Maryland**	**Oregon**	**Utah**
Databases Matched:											
Unemployment Insurance	✓			✓	✓	✓	✓	✓	✓	✓	✓
Income tax		✓	✓		✓						
Federal/State								✓			
Higher Education							✓	✓			
Project Management:											
Department of Education								✓			
Postsecondary Education Governing Body							✓				
State Employment Division				✓		✓				✓	✓
University	✓		✓		✓						
Other		✓							✓		
Percentage of persons found through matching process*	62	58	100	Pilot	81,70	100	66	75	Pilot	80	Pilot

*For studies, percentage of persons found is pertinent to the year in which a study was first conducted and the particular database employed. For example, in Wisconsin, 81% of the 1983 graduates were found when student records were matched with 1985 state income tax records; 70% were found when the same student records were matched with 1988 state unemployment insurance records.

For systems, number of persons found refers to the average number found each year through the matching process. For example, Florida is able to find 75% of the names submitted by matching subject records with numerous state and national databases. Oregon finds 80% of community college graduate names submitted in unemployment insurance files.

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Follow-up Systems Options

The two means of collecting information about students who have left educational systems–surveys and database matching–both have advantages and disadvantages which must be weighed when determining the best follow-up system for Arizona. As is illustrated in Table 5, follow-up studies/systems using survey methodology are best suited for collecting qualitative information; e.g. answering questions regarding student perceptions of educational experiences or employer opinions of student performance. Surveys allow for the tailoring of questions targeted at specific populations.

Table 5
Follow-Up Surveys Versus Database Matching

	Advantages	Disadvantages
Surveys	• Good at providing qualitative information • Allow for questions designed for specific populations • Better able to collect opinion/perceptual information from students and employers	• Often have poor response rates • Data received often is inconsistent or has incomplete information • Extremely expensive • Not as good for longitudinal studies because of the difficulties of locating individuals over time
Database Matching	• Good at collecting quantitative information • Databases contain standardized, reliable placement information; e.g., unemployment insurance records • Good for collecting information on wages, dividends, and interest information; e.g., income tax records • With the exception of income tax record studies which use aggregate information, database matching enhances the ability to track individual students over time • Requires less paperwork and personnel than surveys • Allows for tracking of population subgroups, e.g., vocational education students • Captures point-in-time snapshots of information	• Single databases do not contain information about all individuals. For example, unemployment insurance records lack information about: -occupations -hourly wages -self-employed or commissioned persons -people employed out-of-state -military, state, and federal -employees -incarcerated or institutionalized individuals -higher education enrollment • Hard to safeguard security of information • Cannot capture information about persons with missing or invalid social security numbers • Cannot capture placement information if program codes are missing or invalid • Difficult to arrange matching procedures with state and federal agencies • Databases have difficult formats and data definitions • Databases do not always have current, up-to-date information • Hard to determine which agency will control the matching process
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However, the survey method has been traditionally plagued by low response rates. Once students leave school, locating them is always problematic. For longitudinal studies, student mobility hampers data collection efforts even more. Follow-up mailings and telephone calls to increase responses—and the manpower and materials needed to conduct a survey—make survey methodology extremely expensive. A final disadvantage of surveys is that information returned is often incomplete or inconsistent.

In contrast, database matching has several advantages. Because computer matching is less paper-and-personnel-intensive than surveys, costs are significantly lower. Database matching often provides more reliable quantitative employment information than does survey methodology. Because databases contain information collected over time, longitudinal tracking of student performance is usually possible. Finally, database matching allows for point-in-time snapshots of targeted student populations.

Database matching studies and systems are not without their limitations, however. Databases do not always contain all the follow-up information desired, necessitating accessing multiple databases to obtain desired information. Comparison between databases is not always possible, due to conflicting data formats or inconsistent data definitions. Databases do not solve the problem of incomplete information, as social security numbers and program codes are often invalid or missing. As many of the databases contain confidential income information, database matching usually requires complex arrangements with state or federal agencies and may require enabling legislation to allow matching. Another concern is that information contained in databases is not always current. A final problem is jurisdictional—which state agency will actually have the responsibility for conducting the database match and controlling the data.

STUDENT TRACKING SYSTEMS

> ***Student tracking system*: processes to monitor the longitudinal progression of cohorts of students within an educational system—from grade to grade, school to school, district to district, and between educational levels (elementary to junior high to high school to college or university)—according to an established set of rules and procedures.**

Description and Purposes of Student Tracking Systems

The third type of student data systems are student tracking systems. While follow-up studies and systems focus totally upon students who have exited educational systems or training programs, a student tracking system's primary emphasis is upon following students while they are still involved in educational endeavors. Collecting information about student outcomes once they have left an institution (a student follow-up system), may become an extension of a student tracking system.

According to Peter Ewell, an expert on the subject of student tracking systems, the basic features of a student tracking system are that it is:

1. "based on unit record information on student characteristics, enrollment, and performance;
2. intended to provide management information, not to replace existing student records systems;
3. based on a 'cohort' methodology of longitudinal recordkeeping; and
4. implemented on a departmental, school, institutional or statewide basis." (14)

Tracking systems are used to monitor students' horizontal and vertical progression over time through an education system. Student tracking systems are ways of organizing data that already have been collected in a different form in order to:

- diagnose, monitor, and remedy student problems before they become chronic;
- keep a historical record of student performance and, in some cases, compare in-school and post-school performance data;
- organize existing student data to allow for either program or institutional evaluation; and
- keep track of remediation, retention, and transfer behaviors.

Types of Information Collected in Student Tracking Systems

Tracking systems capture permanent or semi-permanent information such as age, gender, ethnic origin and citizenship, admission dates and status, program or major and academic track, last school attended, promotion or retention status, diploma or certificate received, grade point average and test scores. Variable academic or course information that changes from semester to semester are also data elements of interest to tracking systems—e.g. credit hours attempted/completed; courses attempted/completed; current major or program; grade point

average; types of courses; and degrees, diplomas, or certificates awarded. Optional follow-up elements might include transfer information, new programs of study, additional degrees obtained, employment status and wages, and employer ratings of student skill levels. Regardless of the individual data elements selected, a state-level student tracking system is based upon the premise that the information requested probably exists in a disaggregated form somewhere on the institutional level.

Student Tracking System Characteristics and Implementation Status

Appendix C describes several local, state, and national student tracking systems. Tabular representations of the research were not possible, given that many of the systems had not been fully implemented and details were sketchy at the time of this study. Among the systems detailed in Appendix C are:

- a Pinellas County, Florida, system to track 1988/89 kindergarten students for thirteen years;
- K-12 special education tracking systems in California, Illinois, Pennsylvania, Tennessee, and Wyoming;
- a dropout-tracking system being piloted by five Florida K-12 districts in 1990;
- a longitudinal database established by the University of California System in 1982 to measure the retention and persistence of entering students;
- the Association of Learning Assistant Directors in Community Colleges (LARC) and the Texas Longitudinal Student Tracking and Reporting System (LONESTAR) systems to track remedial education students. The LONESTAR system also looks at student progress in non-remedial courses and advancement towards degree completion for students seeking degrees;
- a national system—the Migrant Student Record Transfer System—established in 1969 to track children of migrant workers; and
- a description of the inter-level information exchanges in Hawaii, North Carolina, South Carolina, and Texas in which community colleges and universities are required to report the academic performance of entering college freshmen or transfer students back to the schools they last attended.

Student Tracking Systems—Design and Implementation Problems

The major problem that exists in implementing state-level tracking systems is the multiplicity of systems—each with its own record formats, types of computer software/hardware, and data definitions. This concern is compounded when a tracking system attempts to track students between educational levels, as systems designed to meet the needs of a K-12 institution are not necessarily the same as those of post-secondary systems designs. Because of data translation problems, one of the major steps in developing a state-level student tracking system has often been to develop standardized data definitions, transcripts, and record formats across a state. Arriving at a consensus on which data elements are required and which ones are optional is also a complex issue.

How often to establish cohort groups and the length of time each cohort will be tracked are two other issues encountered in tracking system design. Post-secondary institutions most often track students from 5 to 7 years, which means that follow-up systems are often incorporated within tracking systems. (14) No precedent has been established as to how long to track high school students. Computer storage capacity and expenses are frequently determining factors in deciding how long students will be tracked.

Advantages of Implementing a State-level Student Tracking System.

Despite all the difficulties of implementing state-level tracking systems, there are advantages to doing so. A state-level tracking system can extend the capabilities of small schools, colleges, and universities without research units. By organizing existing information in new ways, state-level tracking systems have the capacity to compare behavior and performances of sub-groups of students. Finally, student tracking systems enable trend analysis for better decisionmaking on both state and institutional levels.

Student Tracking System Options

Although Peter Ewell's work has focused primarily on post-secondary student tracking, Ewell has identified four options for implementing a state-level tracking system. The four choices identified below range on a continuum from being totally prescribed to entirely voluntary in nature. These options should be considered in deciding how best to meet the requirements of S.B. 1234 (1989).[12]

1. Establish a state-level unit record system. The state-level unit record system would be housed in a central location and its primary function would be to collect data from all appropriate institutions across the state. Information would be transmitted from individual institutions in highly specified format. Most data elements would be required by statute and would have been commonly defined. Examples: Florida and New Jersey.

2. Collect data through common unit record information at the institutional level. Each institution would have its own unit record system, but all would be organized in a similar fashion with commonly-defined data elements. Information control would be on the institutional level, with data forwarded to the state for periodic analysis. Examples: Colorado, Hawaii, Tennessee Minority Achievement.

3. Develop consortia of institutions. Institutions would share information on a voluntary basis in order to meet state reporting requirements. Each institution would have its own system, but would agree upon common data definitions, software, and methodology for reporting purposes. Examples: Texas (Lonestar), California (LARC).

4. Continue to maintain institutional systems. Each institution would have its own system and would submit its own reports to the state. Examples: most states. (14)

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12 The examples of the states given are post-secondary systems.

STUDENT INFORMATION SYSTEMS

> ***Student information systems:*** **processes that allow for the organization of individual information on all students within an educational system into computerized student unit records**

Description and Purposes of Student Information Systems

While state-level student information systems are similar to tracking systems in their attempt to more efficiently organize and analyze data, student information systems are larger in scope. Student tracking systems focus on targeted student cohorts, while student information systems include records of entire student populations. Student information systems most often concentrate upon a particular educational segment–K-12, community college, or university. Finally, student information systems are often part of larger education management information systems that include financial and personnel data.

On the state level, student information systems serve several purposes, as illustrated in Table 6 on the next page. Student tracking, research and analysis, improved reporting of data, and data consistency/compatibility were among the purposes of state-level student information systems identified by Morrison Institute.

On the institutional level, student information systems are most often used for managerial functions–e.g., student scheduling, attendance and grade reporting, and report card production. Other institutional uses of student information systems include research, reporting, and forecasting.

Both the Morrison Institute study and a 1988 California study (6) found that the main reason for implementing state-level student information systems was to improve student recordkeeping functions. The California study postulated that the extreme expense of implementing a student information system that collected comprehensive data on each student within the system could not be justified on a policy analysis/ decision making basis alone.

Data Elements Used in Student Information Systems

Data elements in state-level student information systems vary, depending upon the use and purpose of the system. For example, health records and student test scores are of greater import to K-12 student information systems. Admissions and financial aid information have greater meaning on the post-secondary level. Elements common to both secondary and post-secondary systems studied included student identification numbers, name, sex, ethnicity, birthdate, and institution name and location. Course-related and completion information were collected by most of the state-level student information systems studied. Appendix E lists some of the specific data elements included in state-level student information systems.

Implementation Status of Student Information Systems

Table 7 on page 23 summarizes the implementation status of student information systems in the 22 states interviewed by Morrison Institute.[13]

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13 Personnel from a total of 28 states were interviewed. Personnel in Indiana, Kansas, Missouri, Nebraska, Nevada, and Oregon were interviewed only regarding follow-up systems.

Table 6
Purposes of State-Level Student Information Systems

Characteristics	K-12						Integrated*	
	New York	North Carolina	South Carolina	Texas	Utah	Washington	Florida	Georgia
Accountability/Recordkeeping	✓	✓	✓	✓	✓	✓	✓	✓
Reduction of local data burden	✓			✓	✓		✓	
Improve reporting procedures	✓	✓					✓	✓
Audit/review of data for accuracy	✓	✓						
Improve compatibility between systems							✓	✓
Flexible use of information for analysis	✓	✓		✓	✓		✓	
Track dropouts				✓			✓	
Serve local management/information needs		✓		✓	✓			
Central database of facts about public education				✓				
Program planning					✓			
Transfer of student records in timely fashion							✓	✓

*Kindergarten through post-baccalaureate student information system.

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Table 7
Implementation Status of State-Level Student Information Systems

State	K-12	Post-secondary*	Integrated
California	No	No	No
Colorado	No	Yes	No
Connecticut	No	Yes	No
Florida	Yes	Yes	Yes
Georgia	Pilot	Pilot	Pilot
Hawaii	No	No	No
Illinois	No	No	No
Kentucky	No	No	No
Maryland	No	Yes	No
Michigan	No	No	No
Minnesota	No	Yes	No
New York	pilot	No	No
North Carolina	Yes	Unknown	No
Ohio	No	Unknown	No
Oklahoma	No	Yes	No
Pennsylvania	No	Unknown	No
South Carolina	Yes	No	No
Tennessee	No	Yes	No
Texas	Yes	Yes	No
Utah	Yes	No	No
Virginia	Planning	Unknown	No
Washington	Yes	No	No

*Information about California, Colorado, Florida, Georgia, Hawaii, and Michigan postsecondary systems were obtained from Morrison Institute Interviews. Information on remaining postsecondary systems comes from *A Comprehensive Student Information System*. (6)

The Morrison Institute research findings paralleled the results of a 1988 survey of 49 states and Washington, D.C., conducted by the California Post-secondary Commission. Both studies found that no state had tried to develop a student information system concurrently in both K-12 and post-secondary education systems. Student information systems were most often phased-in on the post-secondary level first, the Florida system being the exception. (6)

Characteristics of Student Information Systems

Many of the state-level K-12 and/or integrated student information systems were formed in response to legislative mandates (Table 8). Only two states in the Morrison Institute study voluntarily implemented K-12 student information systems. Post-secondary systems were most often formed in response to state and federal reporting requirements. Table 8 "identifies" those states within which systems were mandated and the various components required by law. Table 9 on the next page lists some of the additional features of state-level student information systems.

Table 8
Legislated State Mandates

	K-12						Integrated	
	New York	North Carolina	South Carolina	Texas	Utah	Washington	Florida	Georgia
None					✓	✓		
Student identification system	✓						✓	
Student information system	✓	✓	✓					
Comprehensive management information system*				✓			✓	✓
Common transcripts**							✓	
Electronic records transfer***							✓	
Data analysis, review, auditing, and reporting		✓						
Dropout tracking				✓			✓	

**Comprehensive management information system* - a computerized system containing not only student data but also staff and fiscal information.
***common transcript* - a transcript in which the ordering of the student information and the definitions of data elements, e.g., course information, are standardized throughout the educational system.
****electronic records transfer* - transmission of student information via telephone lines rather than by paper documents, diskette, or tape records.

Table 9
Characteristics of Student Information Systems

	K12						Integrated	
	New York	North Carolina	South Carolina	Texas	Utah	Washington	Florida	Georgia
Common transcript		✓		✓	✓		✓	
Common permanent student record					✓		✓	
Electronic records transfer (state reporting)	✓		✓		✓		✓	✓
Electronic records transfer (interdistrict)	✓	✓			✓		✓	✓
Magnetic tape exchanges			✓			✓		
Hardware/software (specified)		✓			✓			✓
Hardware/software (discretion)	✓			✓			✓	
Required state data elements, (coding, format, length definition specified)				✓			✓	✓
Common data definitions	✓				✓			✓
Social security number		✓		✓			✓	✓
Unique identification number	✓				✓	✓	✓	✓
Integration with other management information, e.g. staff/financial		✓		✓			✓	✓
Relational database management system				✓				
Regional data processing centers (number)	13	134	-	20	-	-	4	4
Participating districts	730	134	-	254	40	272	67	186

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While student information systems varied from state to state, certain characteristics were fairly common to each. Most of the systems processed information at the regional level, with from 4 to 20 data centers handling information funnelled from individual institutions.[14] At predetermined survey periods, selected student information was submitted by electronic transmission, magnetic tape, diskette, or paper. Upon completion of the data analysis, student progress reports were sent back to original institutions and forwarded to the state.

Other Activities in Addition to State-Level Student Information Systems

General system characteristics of state-level student information systems in Florida, Georgia, New York, North Carolina, South Carolina, Texas, Utah, and Washington have been featured in the preceding sections. Appendix D provides a greater level of detail about the systems in these states.

Also included in Appendix D is information about state and national level projects pertinent to the development of student information systems around the country. Among the projects highlighted are:

- sophisticated student information systems that have been developed in the cities of Los Angeles, California, and Austin, Texas;
- an integrated management information system being designed in the state of Ohio;
- an education performance recognition program and student identification system being designed in Virginia;
- California's mandate to provide information about a student's progression from kindergarten through graduate school and the steps that have been taken to meet this requirement;
- highlights of post-secondary student information systems in Colorado, Indiana, Louisiana, Massachusetts, Minnesota, and New Mexico;
- common transcript and electronic transfer of records projects in Michigan, North Carolina, and Texas; and
- a 1990 records transfer pilot by the National Center for Education Statistics.

Design and Implementation Problems of Student Information Systems

From the Morrison Institute interviews and materials reviewed, several design and implementation problems encountered in developing student information systems became evident.[15] Among the obstacles confronted were:

- ❒ Technical problems - The number of local student information systems in existence--each with their own hardware, software, student numbering, data formats, and communications protocol--caused numerous technical problems in activating state-level systems. Inadequate technical support for institutions which lacked sophisticated computer personnel was also a difficulty.

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14 New York, North Carolina, and Texas handle information in this way. Florida has a more centralized system in that 3 of the 4 processing centers are university level. Information transmitted from elementary and high school districts go directly to a single processing center. Utah has a centralized on-line system in which information is constantly updated.

15 Since student information systems incorporate aspects of the other three systems--student identification, follow-up and tracking--many of these obstacles should be reviewed even if a large comprehensive student information system is not recommended for Arizona at this time.

- Institutional resistance to a state-level system - Because many schools and districts had their own student information systems, implementation of a state-level student information system was sometimes perceived as placing undue data collection, personnel, and computer reprogramming burdens on local entities. The locus of control of student information was also a related issue--whether information would reside at the state level or be controlled by institutions.

- Student identification number - Determination of what to use as a student identification number was a key issue, as discussed previously in the section on student identification systems. Use of social security numbers on the post-secondary level versus assigned numbers on the K-12 level complicated both student tracking and the establishment of integrated student information systems.

- Security of information - Related to the student identification number concerns was the issue of how student information might best be safeguarded, especially in the cases of electronic transmissions of data. What procedures would be established to protect the sanctity of student information, which personnel would have access to such information, and which other state agencies would be allowed to use data for research purposes were among the items identified as security problems.

- Data definitions - Arriving at common data definitions that met the needs of all educational parties involved was cited as a difficulty. In the case of integrated student information systems, ascertaining which data elements met the needs of both K-12 and post-secondary institutions was problematic.

- Costs - One of the most consistent problems cited was cost. State-level student information systems are very expensive. Yet several states--Florida being one of them--said that because hardware, software, training, and other needs varied from locality to locality, calculation of the true costs of system implementation was difficult. Because costs were not readily evident, state-level funding was not always adequate to meet implementation costs. The following are illustrations of the expense of implementing a state-level student information system:[16]

    - a 1986 California study estimated maintenance costs for a comprehensive kindergarten through post-graduate student data system at between 69 million to 109 million dollars. (7)

    - in 1990, the state of New York allocated $9 million for design and implementation of a comprehensive student information system. This did not include all the state support for technology improvements needed to make the system operational (43).

    - North Carolina has spent $35 million to implement a uniform education reporting system, with an additional $10 million appropriated in 1991 to complete the system. (93)

- Miscellaneous problems - Two other miscellaneous problems were mentioned by the states interviewed. Submission of valid data by local institutions was cited as a difficulty. Designing a system with the storage capacity to capture longitudinal information was also reported.

Advantages of State-level Student Information Systems

While the design, implementation, and expense problems encountered in establishing state-level student information systems seem overwhelming, these systems do have value. Through the ability to transfer records in a more timely fashion, schools are able to more effectively meet the needs of their students. As reporting procedures are tightened, better access

16 Appendix D contains other cost estimates for the design and implementation of student information systems.

to information improves decision-making not only on the state level but on the local level as well. Finally, a state-level student information system allows local and state administrators to have information at their fingertips which can answer questions regarding the efficacy of the state's education system.

State-level Student Information System Options

The purposes, characteristics, advantages, and disadvantages of state-level student information systems have been discussed at length. In determining if a state-level student information system in Arizona is warranted, several key issues need to be addressed. Possible options can be envisioned on a continuum–from the most restricted, highly specified system to a very loose, voluntary system. For example, the options laid out by Peter Ewell in regard to tracking systems–a state-level unit record system, institutional unit record systems with common data elements, consortiums of institutions, and independent systems–are also options for decisionmaking in the area of student information systems. Among the decisions that Arizona will need to make are:

1. What are the primary purposes of the system?

   As the purposes of the student information systems studied ranged from reporting and recordkeeping functions to student tracking, the primary functions of the student information system should be clearly identified at the outset.

2. Should the system be mandatory or voluntary?

   Florida had the most highly-mandated system examined, with everything from common transcripts to record transfers mandated by law. Systems in which everything is statutorily required sometimes suffer from local resistance and are extremely costly. Voluntary systems often fail to include all state institutions, which makes aggregation and translatability of data difficult.

3. Should the system encompass all grade levels?

   Only one state, Florida, had implemented a system that encompassed all grade levels, kindergarten through post-secondary.[17] The differing needs of elementary and secondary schools versus post-secondary schools make design of unified student information systems difficult. By the same token, lack of common terms creates problems when tracking students from high school into higher education.

4. Should the system specify definitions of all or just selected data elements?

   There are numerous options for data elements. All possible variables can be identified, with state-required definitions, coding, record length and formats. For example, Florida has identified and specified the format of 440 data elements. Another option is to identify only those data elements truly of value at the state-level and delineate the form in which the variables will be reported to the state. A third option is to identify and arrive at common definitions for all variables but only specify the format for those items of interest to the state.

5. Should the system be integrated with other systems; e.g. staff and financial information?

   Four states–Florida, North Carolina, Ohio, and Texas–were developing or had implemented systems melding student, financial, and personnel information. All three types of information were felt to have value in the decisionmaking process. The obvious

17 Georgia is piloting a kindergarten through graduate school student information system.

disadvantage of comprehensive management information systems was their cost. One way of circumventing huge costs was to phase-in the implementation of the different types of information systems.

6. Should control of the information be housed in a central mainframe computer on the state level or controlled more at the local level with processing done at regional processing centers?

   One of the key design questions is whether to house the information centrally or to have the locus of information remain on the institutional level, with processing done at regional centers and then forwarded to the state level. Most of the states examined chose to have regional or distributed processing. Centralized mainframes are very costly and have limitations as to the amount of archived information available. However, centralized systems have the advantage of easy access, aggregation, and manipulation of data. Decentralized systems are more palatable to local institutions, but may have limited ability for data retrieval in short time spans.

RECOMMENDATIONS

This document has examined student identification, follow-up, tracking, and information systems for the purpose of assisting the Arizona Department of Education to comply with S.B. 1234 (1989). This research, coupled with information collected on the status of these four types of systems in Arizona, serves as the basis for the recommendations that follow.[18]

1. The terminology used in S.B. 1234 (1989) must be clarified.

- Part of the problem in determining how best to fulfill the requirements of S.B. 1234 (1989) has arisen from confusion as to what a "data collection system", a "student identification system," and a "student tracking system" actually are. Prior to any true design work being accomplished, the parties involved (the Arizona Department of Education, the Arizona State Board of Directors of Community Colleges, and the Arizona Board of Regents) must have a consistent understanding of what is meant by the task prescribed in the law.

- Definitions of all pertinent terms; e.g. student identification, follow-up, tracking and information system, should be standardized.

2. A formal state-level task force should be established to work towards fulfilling the requirements of S.B. 1234 (1989).

- While S.B. 1234 (1989) mandated that the three educational governing bodies work together to accomplish the identified tasks, it did not indicate how this was to be executed. To date, each educational segment has been working independently towards realizing the mandates of the legislation. In addition, informal relationships have developed to attempt to satisfy S.B. 1234 (1989) requirements. However, truly coordinated efforts at accomplishing the objectives have stalled, although limited attempts have been made. A formal mechanism either established by the legislature, governor's office, or spearheaded by one or more of the involved agencies is needed to encourage consensus in designing the mandated student data system(s).

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18 Recommendations 2 through 6 are based upon the definitions used throughout this document. It should be noted that recommendations two and four parallel the conclusions drawn by Dr. Lou Weschler in *Does Arizona Know Where Its Students Are? Status of Student Data Systems in Arizona*, although the authors arrived at their recommendations independently.

- ❒ The task force should have responsibility for designing the following:
    - A state-level student identification system common to both K-12 and post-secondary institutions. Without a uniform numbering system, the state's ability to track student outcomes and transfer student records between institutions is limited.
    - A state-level student information system encompassing kindergarten through postgraduate education that would incorporate both tracking and follow-up systems in its design.
- ❒ The task force should recommend a time table for piloting or phase-in of the student data systems and should identify the state-level body responsible for implementation.

3. **In designing a student identification system, it is recommended that the state use social security numbers as the uniform student identifier.**[19]

    - ❒ Social security numbers as identification numbers are justified because:
        - Precedence of usage has been set in other states on both the K-12 and post-secondary levels. On the K-12 level, both North Carolina and Texas use social security numbers as student identifiers.
        - Using social security numbers enables the tracking of student information into employment-related databases.
        - Given the recent change in federal law requiring parents to obtain social security numbers for children, social security numbers should be more readily available than in the past.
    - ❒ Social security numbers should be collected from each student upon his/her first enrollment in school.
    - ❒ Because submission of social security numbers is voluntary by federal law, a standardized alternative numbering system should be employed for those students for whom social security numbers are unavailable. The state should determine if lobbying for changes in this federal law is feasible.
    - ❒ Use of social security numbers as identification numbers should be phased-in, to accommodate some of the systems currently using other student numbering schematics.
    - ❒ State enabling legislation should be enacted to help create a uniform student identification system which uses social security numbers and an alternative numbering system for students whose social security numbers are not available.

4. **When designing the state-level student information system the task force should consider the following recommendations:**

    A. <u>The scope of the system should be limited and the purposes of the system clearly defined</u>.

        - ❒ One of the primary objectives of a student information system should be to facilitate longitudinal tracking of students and collection of follow-up data to assist in policy decisions. Other purposes to be considered would be to improve recordkeeping and reporting functions.

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19 Although legal analysis conducted by a Morrison Institute attorney revealed that under certain conditions it is legal to use social security numbers, the Department of Education should formally request the Attorney General's office to review this issue.

- ❒ In order to limit system costs and focus upon specific state needs, the task force should consider a phased-in approach to system design which would:

  - First, establish common numbering systems and standardized data definitions.
  - Second, design a tracking system which would incorporate follow-up elements. Follow-up efforts should include a combination of follow-up surveys and database matching of student information with employment and higher education databases. Statutory changes to allow matching of student education records with records in other state data bases—e.g. the Department of Revenue or the Department of Administration—would be needed.
  - Third, target vocational education students as the first group of students to be tracked, with eventual expansion of a tracking system to include other cohorts of students.

B. The system should be mandatory. Because of the issue of local resistance, a voluntary system would not accomplish what the state intends. The pilot phase of implementation could be on a voluntary basis.

C. The system should encompass all grade levels, but must be realistically phased-in. The task force which designs the system must determine on what educational level information needs are currently the greatest in order to assign implementation priorities. Each institution should continue to have its own unit record system, which would be adapted to the state-level requirements.

D. A standardized state data dictionary should be developed.

- ❒ The dictionary should include narrative descriptions of data elements, format and coding specifications.
- ❒ To the extent possible, all data elements should be defined, but only those data elements of true value for both educational levels should be required for state-level reporting. Care should be taken in identifying crucial data elements, to avoid the "garbage in, garbage out" syndrome of collecting too much data.
- ❒ Existing formats and definitions should be incorporated in the new data dictionary, so as not to place undue reprogramming burdens upon current systems.
- ❒ Data standards developed on a national level and by other states should be examined in the definition process, so that student records may eventually have interstate comparability.

E. Initially, system design should be limited to student information only.

- ❒ Given the magnitude of the design of the student information system and the focus upon student outcomes rather than recordkeeping, fiscal and staff information would not be included in an initial system design. Later expansion into these areas could be explored further.

F. Information should be relayed to the state level at pre-determined intervals through regional processing centers. The system should be decentralized, with information control residing at the institutional level.

- ❒ A decentralized system is recommended because it would have greater flexibility once instituted and would be more responsive to the needs of the institutions. A centralized computer capable of storing all the information generated by a state-level student information system would be extremely expensive. The sheer volume of data might actually inhibit data analysis rather than enhance it.

5. **State-level funding should be secured to design, pilot, implement, and maintain the decentralized student information system. Funding should be provided for hardware and software acquisitions, as well as for technical and training support.**

6. **The state should take all measures possible to assure the privacy and confidentiality of all student information.**

- ❒ Conditions of use of student data should be statutorily defined and in conformance with federal privacy standards; e.g.,
  - at no time should individual student information be released or an individual identified.
  - information collected should be used for aggregate and statistical purposes only.
- ❒ The number of persons and agencies with access to student records or identification codes should be limited and delineated in statute.
- ❒ Security safeguard procedures should be developed to ensure confidentiality of student information. In particular, the security of information transmitted electronically should be protected, using current technologies to encode data.
- ❒ Legislation should mandate the periodic updating of security procedures to reflect the constant advances in technologies.

CONCLUSION

This paper has explored the intricacies of student identification, tracking, follow-up and information systems. The major purpose of this analysis was to assist Arizona in determining how best to provide information to policymakers on our progress toward established state educational goals. As detailed in this manuscript, this task is one of great complexity. In deciding upon its course of action, Arizona must keep in mind that

> "information systems do not, in and of themselves, contribute to improved understandings of the complexities of the educational process. Their benefits lie in the constructive uses to which the system's information base may be applied."(6)

APPENDICES

APPENDIX A: FOLLOW-UP STUDIES AND SYSTEMS USING SURVEY METHODOLOGY

APPENDIX B: DATABASE MATCHING

APPENDIX C: STUDENT TRACKING SYSTEMS

APPENDIX D: STUDENT INFORMATION SYSTEMS

APPENDIX E: DATA ELEMENTS OF STATE-LEVEL STUDENT INFORMATION SYSTEMS

APPENDIX A
FOLLOW-UP STUDIES AND SYSTEMS USING SURVEY METHODOLOGY

Local One-Time Follow-up Studies

San Diego: A proportional, stratified random sample of San Diego schools' 1984 graduates is being followed for five years. Students are selected based upon race, gender, and school attended—either comprehensive or atypical school categories. Supplemented by phone interviews of non-respondents, two mailings of a one-sheet questionnaire yielded a 74% response rate two years after the students had graduated. A brochure summarizing the results of the first year's survey were distributed to students to stimulate response. (57)

Sandy Union High School District: A six year follow-up study is planned by the district, which intends to survey students one, three, and five years after graduation. Ninety-two percent of the 170 students completed questionnaires one year after graduation. (58)

State One-Time Follow-up Studies

California: A five year follow-up of 1983 public and private high school graduates was initiated by the California Post-secondary Commission. Students were surveyed six months after high school graduation to determine employment and education status, resulting in a response rate of 35%. A second survey of students one year after high school graduation asked students about their university eligibility status, their educational aspirations, and their opinions of their high school experiences. (8,9)

California: A three year follow-up study examined employment and education-related outcomes of vocational education students, particularly special needs students. The second year of the study, an additional cohort of students was selected to provide more specific training-related information. (78)

Florida: In a 1986 study sponsored by the American Council on Education, 1500 general education diploma (GED) and regular Florida high school graduates were interviewed by telephone about their post-high school activities, educational experiences, and goals. The study had a 97% response rate. (35)

Oregon: A 1984 study examined the impact of vocational education training upon student's higher education and employment outcomes. 1981 high school graduates and early leavers from 19 high schools were surveyed either by mail or telephone. Information obtained from the student survey was supplemented by student transcript and permanent record information, which allowed comparisons of students based on the number of vocational classes taken. In addition vocational education teachers in specific occupational areas were asked to rate programs. The 19 schools participating conducted the surveys and were able to add questions of interest to the original 42 item questionnaire. (54,55)

Wisconsin: Wisconsin conducted a survey of large businesses to identify the skills and competencies employers desire in high school graduates. The four survey forms administered to company executive officers, personnel officers, supervisors, and employees were developed from focus group meetings with chamber of commerce members and reviews of other national and state employer surveys. 32% of the 7400 businesses surveyed returned forms. (72-77)

National One-Time Follow-up Studies

High School and Beyond: The National Center for Education Statistics conducted this six year study. Secondary and post-secondary transcripts, financial aids records and surveys of administrators, teachers, students, and parents were collected and submitted by the 1015 participating secondary schools. The first cohort group– samples of 10th through 12th grade students – was established in 1980. Additional cohorts were added in 1982, 1984, and 1986. Students who had graduated were surveyed by mail, supplemented by phone or personal interviews of non-respondents. (106)

National Education Longitudinal Survey (1988): Parents, teachers, principals and 32,000 eighth graders from 1000 schools were surveyed as part of another National Center for Education Statistics project. The same cohort will be sampled again biennially through 1998. Vocational Technical student experiences and career choice decisions are of particular interest to this study. (106)

Local On-going Follow-up Systems

Rochester City School District: The Rochester City School District has been conducting graduate destination surveys of its students since 1979. Surveys are mailed to students, followed by telephone and school staff contacts in the case of non-respondents. Using this methodology, 82% of a randomly-selected sample of 1986 graduates surveyed six months after graduation responded. The district also conducts baseline surveys of seniors for follow-up comparison purposes. (56)

State On-going Follow-up Systems:

Connecticut: Seventeen regional vocational schools, 146 public high schools, and 92 private high schools collected post-secondary education and employment-related information about their 1985 graduates as part of a 1986 statewide study. This study of 1985 graduates was reflective of annual efforts to collect information about Connecticut's students. (11)

Delaware: Six months after graduation, 1986 Delaware high school graduates were surveyed regarding their current employment and education status and their opinions of their high school's curriculum and programs. Sixty-two percent of the 5500 students surveyed returned usable questionnaires. School guidance counselors were responsible for mailing the forms to students and conducting follow-up mailings and telephone contacts. Schools were able to "piggyback" questions of interest to the basic state survey form. Delaware annually collects information about its students. (12)

Hawaii: Ten months after graduation, a random selection of Hawaii's 1986 graduating class was surveyed regarding their education and employment status and their perceptions of high school. The response rate was 45%. Student follow-up studies are conducted every three years by the State Department of Education. (32,86)

Iowa: A base data survey of 20% of Iowa's secondary schools and area schools served as the basis of selection for a second survey of 1985 completers and leavers of vocational programs. Thirty-one percent of the students surveyed returned questionnaires after three mailings by the Iowa Department of Education. Employers of students working in fields related to their high school training were also surveyed by mail. A similar student and employer survey was conducted for Iowa's post-secondary vocational completers and leavers. Annual surveys of vocational completers and leavers are conducted by the state of Iowa. (34)

Minnesota: The Minnesota Secondary School Follow-up System was initiated in 1972 under a grant from the Minnesota Department of Education. According to the materials reviewed by Morrison

Institute, in 1985 approximately 84% of the 150 Minnesota high schools participated in the system, with a 70% response rate from students. The system has been used primarily to conduct one year follow-ups of student employment and education activities subsequent to dropping out, graduating, or exiting from high school and to compare actual activities with planned student goals. Although the system has longitudinal capabilities, the local education agencies (LEAs) that serve as collection agents have not chosen to survey students for more than a one year period.

While the system is decentralized, standardized survey instruments and regional training sessions for LEA personnel have been developed by the Department of Education. LEA's collect the student data by mail or telephone, code it, enter it into an Apple II computer, and submit it via floppy disk to Mounds View Schools. This centralized data center converts the submitted information into a form capable of being processed on a mainframe computer, and feeds reports back to LEA's and the state department for analysis. (38,40)

Minnesota technical colleges also have a follow-up system. Each college is required to provide the state with information about technical program enrollees, including their subsequent job placement and duties. Each college determines its own method of data collection and submits information at designated times of the year. Randomly-selected student information is audited to ensure data accuracy. (39)

Missouri: A five-year follow-up study of 1981 Missouri high school vocational and non-vocational graduates examined the effect of high school training upon successful post-high school transitions, as measured in salary and employment outcomes. Equivalent samples of students from area vocational and sending high schools were surveyed, with response rates of 62-77% per year. (41)

Interviews with personnel in the Missouri Department of Education revealed that the legislature requires the state to provide information on post-school employment and college enrollment. Districts collect information on each student for a period of five years. (92)

South Carolina: South Carolina law requires that vocational education students must be surveyed by school districts ten months after graduation for the purpose of determining job placement status. Districts must provide the State Board of Education with an annual report of the survey findings. Any employment, continuing education or military enlistment in areas related to high school training are considered successful placement. For funding to continue, vocational programs must have a 50% placement rate over a 3 year period. (99)

In addition to the surveys completed by districts, a study of South Carolina's vocational education system was conducted in the early 1980s. Baseline surveys were administered to 1000 juniors and seniors in 12 South Carolina schools. A subsequent telephone follow-up of 300 high school graduates asked students their opinions of and experiences with their high school vocational programs. (61)

Wisconsin: The Wisconsin Board of Vocational Technical and Adult Education (VTAE) requires submission of follow-up information each year from districts as part of a larger vocational education program self-evaluation process. Eleven surveys (seven of them optional) measure teacher, student, and employer perceptions of vocational programs. Students are surveyed 6 months after graduation, five years after graduation, and ten years after graduation. A random sample of employers are surveyed every five years. Student follow-up information is submitted to the Wisconsin VTAE state office on magnetic tape, cartridge, reels, diskettes or via phone lines. Estimated costs were $150,000 for equipment and $200,000 for personnel. (72-77, 105)

APPENDIX B
DATABASE MATCHING

State One-Time Follow-up Studies

Arizona: Arizona piloted a program in 1985 which compared the social security numbers of 1983 post-secondary vocational program completers with unemployment insurance data files. Northern Arizona University collected and analyzed the data. Although the legislation enabling this project remains on the books, the study was discontinued due to lack of financial and political support. (35)

California: As part of a 1983 California longitudinal follow-up study, a randomly selected sample of the names and social security numbers of fifty vocational education students were submitted to the California Franchise Tax Board to obtain wage and occupational data. Fifty-eight percent of the former students were found in this manner. A more comprehensive feasibility study that was planned was never pursued. (78)

Ohio: An Ohio study paired information about the graduates of twelve secondary vocational education programs and two associate degree programs with federal income tax records. Under the terms of a specially-negotiated contract, student social security numbers, program codes, and zip codes were submitted to the IRS, which then released aggregated information about graduates of specific vocational programs. The IRS released no information on programs with less than 10 graduates, to comply with confidentiality requirements.

The Ohio study had both cross-sectional and longitudinal components. Income, employment status, and mobility rates of 1980 graduates were compared to similar national cohorts four years after graduation (1984 IRS records). A longitudinal study of the income performance of 1979 graduates over time was accomplished by comparing 1983 and 1984 income tax records. (31)

Wisconsin: A Wisconsin study matched 1983 vocational technical and adult education graduates with 1985 state income tax records. Using this methodology, Wisconsin was able to track 81% of graduates two years after graduation.

As part of the same study student records were also compared to 1988 first quarter wages in the Wisconsin Wage Reporting System. Using this methodology, 70% of the graduates were found five years after graduation. (62)

Texas: Texas is currently completing the second year of a two-year project using unemployment insurance files to track community college graduates, including Job Training Partnership Act (JTPA) participants. The study is due to be released in July of 1990. (101)

State On-Going Follow-up Systems

Alaska: Due to an Alaska law requiring the hiring of state residents over non-residents for publicly funded construction projects, Alaska employers must submit lists of employees plus their occupations and employment locations as part of their quarterly unemployment insurance submissions. While computer matching of unemployment insurance files with oil dividend fund files are currently being used to determine residency/ non-residency status, it is anticipated that the information may eventually be utilized to assess vocational education program performance and provide career path and occupational mobility information. Yearly legislative appropriations for the computer matching program have been approximately $330,000. (1,2,3,80)

Colorado: Passed by the Colorado legislature in 1985, House Bill (HB) 1187 required the submission of post-secondary institution accountability reports each October. As part of the move to supply accountability information, a longitudinal tracking system was established to monitor post-graduation employment and higher education outcomes for community college degree and certificate recipients. Beginning with a 1985-86 cohort group from 15 colleges and continuing with subsequent cohorts, social security numbers of students were matched against records in the Colorado Commission on Higher Education's Student Unit Record Data System (SURDS), quarterly unemployment insurance records from the Colorado Department of Labor and Employment, and Colorado Community College and Occupations Education System databases. Information on students' demographic characteristics, enrollment patterns, transfer behavior, degree type, wages, industry and location of employment were among the types of data collected. Using this system, Colorado has been able to locate two-thirds of its students one year post-graduation. (59)

Florida: Florida currently has the only state-supported, on-going database matching system–the Florida Employment Training Placement Information Program (FETPIP). The Florida Department of Education administers and manages the system, which was originally designed in 1984 for the purpose of determining the occupational placement of secondary and post-secondary vocational students.

The scope of the project has since expanded to include graduates of selected Florida high schools, JTPA participants, adult migrant education students, and people in the Florida corrections system. Information about these populations is matched by social security number with the following databases:

- Florida, Alabama, and Georgia unemployment insurance records,
- U.S. Department of Defense manpower enlistment files,
- U.S. Government's personnel management information system,
- U.S. Post Office's personnel employee files,
- Community college system's fall enrollment files, and
- University system's spring and initial fall enrollment files.

To supplement the information captured by database matching, two employer surveys are conducted: 1) to determine specific student occupations and 2) to measure employer satisfaction and perception of student training. Employer confidentiality is ensured by legally limiting employer contact to these two purposes only.

Confidentiality of student information is also built into the system. Advance public announcements are required each time database matching occurs, specifying matching procedures and uses of information collected. An additional safeguard is that data must be summarized in aggregates of ten or more students or employers.

Since 1984, approximately $914,000 has been appropriated to FETPIP by the Florida legislature– $317,000 in 1989 alone. In 1989 194,555 records were matched, and approximately 20,000 employers were surveyed regarding student occupations and work locations. Using database matching, 75% of the students with valid social security numbers were found one year after exiting school–at about one-fourth the cost of conventional follow-up surveys. (15-20)

Maryland: Motivated by a request that the governor's employment and training council establish an accountability system for programs that train people for employment, in July of 1990, 100,000 student records will be matched with Maryland unemployment insurance records. Programs to be

included in the initial pilot are : JTPA, Maryland Tomorrow (dropout prevention program), job service, adult basic education, vocational education, and vocational rehabilitation. Over a three to four year period, information on student demographics, employment status, retention, and earnings will be compared to dollars spent per program and expected program outcomes. Estimated cost of the computer matching process is 75 cents to one dollar per record. (37, 89)

Oregon: The Oregon Workforce 2000 Occupational Support bill enabled the creation of the Oregon Automated Follow-up System in order to provide programmatic feedback to schools and supply/demand information to the legislature. In a pilot of the system, twelve quarters of wage history were matched by social security number with information about approximately 15,000 vocational program completers and JTPA participants from four community colleges. Student records from 1984 onward were matched. In an expansion of the piloted system, eight out of 14 community colleges are currently submitting student information.

Confidentiality forms were used to protect the identity of individuals. As a further security measure, information was matched only if a program had more than three students or an employer had more than three employees.

Using database matching, Oregon was able to find over 80% of its former students, versus response rates of 20-30% for previous follow-up attempts. The cost of the pilot was $130,000. (97)

Utah: In the last year, Utah piloted a system designed to provide the state with occupational supply/demand information, as well as input about the success of training programs. Eleven thousand JTPA participants and community college students enrolled in training or vocational education programs at Salt Lake Community College were matched against three years of wage file data. The pilot was made possible by a $10,000 federal vocational education grant. The Utah Department of Employment Security charged $400 for 1000 names submitted. (102)

APPENDIX C
STUDENT TRACKING SYSTEMS

Local tracking systems (K-12)

Pinellas County, Florida: Pinellas County is planning to track 7500 students in the 1988/89 kindergarten class for thirteen years. The database will be comprised of information collected from parent surveys, registration surveys, and standard state data elements. (79)

State tracking systems (K-12)

California: California currently tracks 400,000 special education students. While the Superintendent of Public Instruction in California favors a tracking system to capture dropout information, there is no legislative mandate allowing for the creation of a K-12 tracking system. (81)

Florida: In 1989-90, five Florida school districts are piloting a system to track at-risk students. The purpose of collecting data on students who have left school is to improve intervention programs, identify characteristics of students who might benefit from such programs, and to develop consistent attendance/withdrawal codes.

Three targeted groups will be studied: dropouts, students in alternative programs, and a randomly-selected control group. The sample population will be compared on the basis of demographic data elements available through the state's automated student record system. In the case of dropouts, students will be matched against the state student database to determine if the students are actually elsewhere in the system. As a final element of the pilot, teacher-generated lists of at-risk students will be compared to computer-generated at-risk profiles. (21,79)

Illinois: Because of a legislative mandate, Illinois has been tracking approximately 200,000 special education students each year since 1978. Information is processed at regional data centers. (5)

Pennsylvania: Twenty-five pieces of information on each special education student are fed from 501 school districts to 29 intermediate units. The PENNDATA System took ten years to develop and still is in the implementation stages. One of the major features of the system is strong local ownership of information. Approximately 260,000 students are tracked. (5,79)

Tennessee: Districts submit information on special education students via either floppy disk or scannable forms. Records are kept on approximately 40,000 students. (5)

Wyoming (K-12): In 1990, Wyoming established a minicomputer system to track 10,000 special education students in 49 districts. Thirteen data elements are collected using pneumonic codes. (79)

State tracking systems (Post-secondary)

California: In 1982, the University of California implemented a longitudinal student tracking system as part of its larger Corporate Student System. The purpose of the system was to measure the persistence of entering cohorts.

On the community college level, the Association of Learning Assistant Directors in community colleges (LARC) shares information between member institutions. LARC is a consortium that conducts studies in remedial education and tracks the progress of students from pre-baccalaureate to baccalaureate levels.

Last June (1989), a state referendum was passed which guarantees community colleges and K-12 a certain percentage of revenue in exchange for accountability information, e.g., collective data on student grade point averages (GPA's), test performance, etc. To date, the educational institutions have not received money to accomplish this purpose. (6,81)

Texas (post-secondary): In 1987, the National Center for Higher Education was contracted to design a system--LONESTAR (Longitudinal Student Tracking and Reporting)--to assist Texas community colleges in meeting state reporting requirements. The effectiveness of remedial programs was of particular interest, although progress towards degree completion and performance in non-remedial courses was also measured. A voluntary system, LONESTAR was planned to provide the 62 community colleges in the state with maximum flexibility.

The software package created for LONESTAR uses SPSS-x, a canned statistical program. Common student identifiers, record handling procedures, and data definitions were developed as part of the LONESTAR system. The system has three types of data elements:

- fixed elements- demographic, enrollment, and academic data information collected from a student's permanent record upon entry into school;
- variable elements- academic and remediation data collected each term; and
- optional elements- follow-up elements once a student has left school. (14)

National tracking systems

Migrant student record transfer system (K-12): Initiated in 1969, the Migrant Student Record Transfer System was designed to track the movement of migrant children from school to school. Health and educational student records are transmitted by phone or mail courier to a communications center which then sends the information to the centralized computer in Little Rock, Arkansas. The records are then mailed to the student's new school. The system currently tracks 750,000 students in 30% of the public schools in the United States, the District of Columbia, and Puerto Rico. (36)

National Center For Education Statistics (NCES) Dropout study (K-12): NCES is field testing new definitions of "dropout." From fall of 1989 through fall of 1990, 30 states and 300 districts will provide NCES with enrollment counts using the new categories. A corollary pilot effort will track 1000 students who have dropped out. (79)

Miscellaneous Projects (K-12): The National Center for Education Statistics is developing a form to collect data about students in correctional institutions. The U.S. Department of Education is collecting exit information about special education students. In 1989, the Chief Council of State School Officers (CCSSO) developed a taxonomy to compare 7th through 12th grade math and science course information submitted from 39 states. (79)

Inter-level information exchanges

California: Data is being exchanged on an institutional level between the university and high schools. There are plans to link some university and community college databases, using social security numbers as common student identifiers. (81)

Hawaii: Each of the state's universities and several community colleges compile an annual report of entering freshmen, identifying students by district and high school attended. Information is not easily integrated, as each institution has its own computer system. (86)

North Carolina: Under the current system, universities receive transcripts and key the information into their systems. Retention and test score information is fed back to community colleges and post-secondary schools in the form of reports. High schools have not yet been included in this information loop. (93)

Oklahoma: In 1989, the Oklahoma legislature mandated the development of a data collection system to track student past high school into both employment and higher education. An informal committee is working on this goal. A formal task force—consisting of legislators, parents, vocational educators, and personnel from the securities and employment commission— will be formed to tackle this issue. (96)

South Carolina: Colleges and universities must send the results of first semester freshmen back to the student's high school district. (99).

Texas: All freshmen students entering the higher education system take the Texas Assessment of Student Performance Test in Math and English, to determine the need for remediation. The Texas Higher Education Coordinating Board sends these test scores, GPA, and course grade information back to the student's high school district. (101)

APPENDIX D
STUDENT INFORMATION SYSTEMS

Local Student Information Systems

Austin Unified School District: The Austin (Texas) Unified School District has had a student information system in place for 20 years. The system is used for recordkeeping and tracking purposes. Every student in the district is followed. Three types of student identifiers are used: social security numbers, randomly assigned numbers, and a seven digit family code. (101)

Los Angeles: The Los Angeles Unified School District has spent $9 million on a student information system. The system is being used to track every student in the district. Five years in development, the system uses assigned student numbers and tape exchanges. (81)

State Student Information Systems (K-12)

New York: The New York Comprehensive Student Information System is currently being developed to improve management decisions on both the school/district operational level and the state policymaking level. Seven million dollars in state matching funds were allocated to the Big Five Cities (Buffalo, New York City, Rochester, Syracuse, and Yonkers) to develop systems that will not only track students but provide a "common core of student information .. to meet statewide reporting requirements and to provide a common basis for sharing." While initial concentration has been on the Big Five Cities, the system will eventually be statewide.

Demographic, program, attendance and achievement information will make up the core data. Other system files will include information on at-risk students, special education students, career/vocational information, grade reporting, and course scheduling, to name a few.

To date, New York City has implemented its student information system in four out of thirty-two districts and has spent over $90 million in the past five years. 55,000 students are being tracked in Buffalo. The other three cities are in the planning stages of implementation.

The Student Information System is seen as part of a larger effort using technology to improve New York's educational management—including development of a financial and administrative system and better instructional delivery services. The Technologies Network Ties (TNT) program has enabled the electronic transfer of student information by building upon existing infrastructures and linking school districts, regional information centers, and the State Education Department. Over the last five years, $25 million in state funds have been spent to install telecommunication lines, develop common operating systems and database management software, and purchase a mainframe for the State Education Department. (43-49, 94)

North Carolina: The Uniform Education Report System (UERS) was created five years ago by legislative mandate. The purpose of UERS was to improve business and operational capacities of North Carolina schools through the establishment of a distributed processing system.

On the school level, microcomputers handle student and transportation information. Well over half the schools in the state have implemented both student and transportation information systems. Social security numbers are used state wide as student identification numbers.

District office minicomputers process accounting and personnel information. Supplemented by student and transportation data transmitted by schools, staff and financial information is

forwarded monthly via a state data network to the state computer center at the Department of Public Instruction (DPI).

The third level of processing is at the State DPI. A mainframe computer controls data consolidation and maintenance, management and accountability, and research functions.

Given the rigid hardware and software specifications of the system, it not surprising that North Carolina will spend up to $40 million through 1991 to implement UERS. An additional $5 million will be spent at the state level to increasing processing and receiving capacities. (50,93)

Ohio: Ohio is in the process of developing an integrated management information system on the K-12 level. Given the legislative emphasis on accounting and staff functions, the student information component has been the last piece to be developed.

Six hundred twenty-seven educational entities are part of the computer network through which information is transmitted. Twenty-seven regional computer centers are hooked into a microwave system purchased for the state lottery. The state has spent a total of $9 million a year for network, communications, software and support to sites. (51,52,95)

South Carolina: As the result of the South Carolina Education Improvement Act of 1980, South Carolina initiated a student information system which monitored student grades and student attendance. In 1986, test scores were added to the system. South Carolina's system uses unique student identifiers and accomplishes the transfer of student information via tape exchanges and electronic transfers. (99)

Texas: The Texas Education Agency Public Education Information Management System (PEIMS) was created to "enable districts to have management freedom, but to still be held accountable." (101) In particular, the need to obtain better information about dropouts prompted the creation of the student information portion of the system. Beginning in spring of 1990, student information will be submitted twice a year to 20 regional service centers, which will then transmit information in a standard format to the TEA. In addition to transcript information, Texas Educational Assessment of Minimum Skills Test Scores will be sent to the system directly from the testing contractor. Although they cannot require the use of social security numbers, Texas will use this number as an identification number for students whenever possible. (64-66,101)

Utah: Having been six years in the planning, the Utah Student Information System (SIS) was implemented in 1984. The purpose of the system was to establish an automated transcript system, allow for graduation analysis and GPA calculations, and to provide program planning assistance. Forty schools currently use SIS, which is a voluntary rather than a mandated system.

A statewide communications network links microcomputers at the school level with a centralized mainframe at the state department, allowing the electronic transfer of student records and on-line update capabilities at school sites. System software (Softerm by Softronics) can be used on either Apple or IBM computers.

To date, 40 screens of information have been developed with 10 more in the design stage. Student demographic, program, vocational, attendance, awards, health, grades, course schedules, transcripts, and graduation evaluation status information are accessed by using computer-assigned student numbers. The state hopes to expand the system to include both pre-kindergarten and post-graduation transcript information.

Operational costs for the system consist of 1.8 million dollars in state funds plus a like amount in user fees collected from districts. (68-71,102)

Virginia (K-12): Two years ago a communication automation transition committee was formed in Virginia. Committee efforts in the last year have focused upon the development and piloting of an education performance recognition program, which would not only identify indicators of student success but track students throughout their educational careers.

The pilot program is currently underway and a database of 4,6,8, and 12th grade test scores will have been established at the end of this year. Unique 12 digit student numbers will be used on the K-12 level to track students, although student records will have a field for social security number to enable tracking into the post-secondary level.

The costs of implementing an education performance recognition program are estimated at $5 to $13 million. An additional $27.4 million will be needed to buy microcomputers for the districts which are not currently automated. (103)

Washington (K-12): A voluntary student attendance tracking system using unique student identification numbers was implemented in Washington in 1979. Ninety-two percent of the 296 school districts participate in the system, with nine districts choosing to develop their own systems. Information is submitted by magnetic tape. (104)

State Student Information Systems (Post-secondary)

Colorado: Colorado implemented the Student Unit Record Data System (SURDS) in 1986, in response to legislation (HB 1185) passed by the Colorado General Assembly in 1985. The data source for SURDS is existing student record files from all public post-secondary institutions and selected private post-secondary institutions in Colorado. The purpose of the system is to comply with federal reporting requirements, supply timely information to decisionmakers, measure performance of selected groups of students (degrees obtained, retention, and transfer rates), establish a longitudinal tracking system, serve as a basis for program evaluation, and project future enrollment.

Student social security numbers are used to link five files of student information: student enrollment, degrees granted, undergraduate applicants, financial aid, and Colorado student incentive grants. Each of the five files also has common identification, demographic, and enrollment information. The submission of data to the Colorado Commission on Higher Education is staggered throughout the year. (10,82)

Indiana: Indiana collects information on 250,000 post-secondary students on a yearly basis. The Indiana Student Information System uses social security numbers as student identification numbers. (6)

Louisiana: Louisiana updates its Statewide Student Profile days system three times each year. Social security number or driver's license number are used as student identification numbers for the 170,000 students in the system. (6).

Massachusetts: In 1984, the Massachusetts legislature appropriated $500,000 to implement a system to standardize enrollment reporting on the post-secondary level. The Massachusetts Research and Planning Enrollment and Degrees System contains over 130,000 records, identified by using a combination of name and social security number. Demographic, academic, achievement and completion information is recorded each semester. Annual maintenance costs for the system are approximately $300,000. (6)

Minnesota: Minnesota's Student Record Data Base contains information on over 230,000 public and private post-secondary students. Information is collected once a year. Strict policies regarding data use and collection have been developed by the state Higher Education Coordinating Board and state Attorney General's Office (6).

New Mexico: The New Mexico Higher Education Data System contains student enrollment and completion information on 80,000 students. Information is used only by the New Mexico Commission on Higher Education and is updated three times a year. Social security numbers are used as student identification numbers. (6)

State Student Information Systems (K through post-baccalaureate)

California: With the passage of Bill 880 in 1984, the California Post-secondary Education Commission was required to develop a feasibility plan for a study that would

> "provide comprehensive information about factors which affect students' progress through California's educational systems, from elementary school through postgraduate education." (7, p. 1)

The plan identified a modified longitudinal study design that would collect data at crucial points in a student's career (3rd, 8th, and 11th grade and the second year of college) and trace a sample of 150,000 to 200,000 student over five years. Demographic, course, test, program, and institutional information would be supplemented with student and parent perception surveys. Study design costs were estimated at $500,000, with annual survey costs estimated at $10 per student or $2 million. (7)

As a result of designing the longitudinal study, the study team came to the conclusion that a uniform student identification system and common student data core would be more valuable than a longitudinal study. To that end in 1988, the Post-secondary Commission contracted for an analysis of existing California student information systems, a survey of the student information systems in 50 states, and an investigation of the advantages/disadvantages of using social security numbers as student identifiers. The study concluded that:

- Current California student information systems were geared towards record keeping rather than policy analysis.
- The implementation of a state student information was hampered by lack of comparable data and differing automation capacities of institutional systems in the state.
- Post-secondary institutions already collected many of the required data elements.
- K-12 implementation and maintenance costs would be higher than for post-secondary institutions.
- Additional legal research was needed to ensure the confidentiality of student records.

The 1988 report recommended establishing a uniform student identification system using social security numbers, a uniform data collection and reporting program, a state-level educational clearinghouse, a time table for the implementing systems on both the K-12 and post-secondary levels, enactment of enabling legislation and appropriation of funding, and creation of a task force to continue system development.

This year (1989-90) the Commission is piloting a small scale student identification system, to identify obstacles to implementing such a system on a statewide basis. Upon successful completion of the pilot, the Commission is expected to sponsor legislation to act upon the recommendations of the consulting firm's 1988 report. (6,7,81)

Florida: In 1981, the Florida legislature mandated the development of an Automated Comprehensive Management Information system which would encompass kindergarten through post-baccalaureate education. The purpose of the system was to improve educational record keeping and reporting functions, provide decisionmakers with historical information about students, and to integrate information provided separately from the various educational segments (K-12, community colleges, and universities). Among the statutorily-required items were electronic transfer of student records and transcripts, the development of a uniform student identification numbering system, and creation of an automated student permanent record format.

Compliance with legislative mandates has been primarily accomplished on the K-12 level. Six times a year, 61 elementary and high school districts transmit information electronically via the Florida Information Resource Network from a mainframe computer at the local level to a state-level mainframe computer. Six of the state's larger districts submit information by magnetic tape. Details submitted to the state include student demographic profiles, course-enrollment history, achievement and completion information, and exceptional student, health, K-3 program, and test data. Data is stored on-line for five survey periods, with historical information archived for five years.

While K-12 electronic record transmissions to the state have been almost fully implemented, electronic relays of transcript and student record information between districts and from high schools to post-secondary institutions are still in pilot stages. Florida legislation laid out a very specific timetable for implementation, which is the reason that K-12 implementation is so far ahead of inter-level information transfers.

To facilitate student numbering, Florida assigns each student a unique 10-digit number, the first two digits referring to the district in which the student originally enrolls. Social security numbers are used on the post-secondary level. An automated permanent student record format has been established, with specified field lengths, formats, and definitions for 440 data elements. A state-level committee consisting of community college, university, program and K-12 representatives was formed to determine data definitions.

The actual costs of implementing Florida's system were not available from Florida personnel interviewed. Among the costs identified were:

- 9 to 10 million dollars a year for support of the computer network system, the Florida Information Resource Network (FIRN),
- 2 million dollars in flow-through implementation funds to districts each year--approximately $1 for each student,
- $900,000 for the Department of Education to contract for data processing, and
- $500,000 in processing fees on the community college level.

Over the seven years of system design and implementation, several problems were encountered. In addition to the inability to calculate system costs, the degrees of computer sophistication between small and large districts posed a problem. Other obstacles included:

- difficulty in agreeing on common definitions,
- different numbering systems on the K-12 and post-secondary levels,

- timely transmission of valid data,
- determining how to capture longitudinal data on-line,
- lack of implementation support,
- asking too much of districts at one time, and
- duplicate assignation of student identification numbers. (22-30,79,84)

Georgia: The state of Georgia has a secondary and post-secondary unified management information system which was initiated in 1979 and is currently being revised. Approximately 650,000 student records were tracked each year, using social security numbers on the post-secondary level and student identification numbers on the K-12 level. Under the old system, tapes of student demographic and course information were submitted to four regional centers in the state.

A new student information system was mandated as part of the Quality Basic Education Act in 1985. The new system will use social security numbers as student identification numbers. The new student information system will be able to transfer all data between school districts and the state using the Georgia on-line network. Computer hardware (Wang microcomputers) and software (OSIRIS) will be specified in the new system, although large districts that already have student information systems in place will be afforded alternative options.

Starting in 1990, the system will be piloted in ten schools in two school districts. By 1994, the new system will have been fully implemented on the K-12 level. Plans are being made to extend the student information system to the post-secondary level.

Under the old system the state legislature appropriated $750,000 a year for the operational costs of the management information system and follow-up tracking of students. For the three year pilot, it is estimated that hardware and application/systems software, maintenance, and training costs alone will be $470,000 for the ten schools. (85)

Common Transcript Projects

Michigan: The Michigan Association of Secondary Principals and Department of Education are currently working on a project to develop a common transcript. (90)

North Carolina: North Carolina is working on a standard transcript, which will be electronically transmitted from schools to district offices to an IBM mainframe at the university level. (93)

Electronic Transfer of Student Records (State and National)

Michigan (K-12): In 1987, 12 schools pilot tested an electronic record transfer system based upon the migrant record transfer system. Although the legislature appropriated $1 million to implement the record transfer system, money was never allocated. It was estimated that it would have cost $7500 per school or .28 per record to implement the designed system. In other projects, the North Central Accreditation Association is working on a regional system of information exchange. (67,86)

Texas: The Electronic Transcript Network of the Association for Higher Education For Texas, a private consortium, has been electronically transmitting student transcripts from Texas high schools to 12 Texas post-secondary schools at a student's behest. The GEIS system is used. A 1988 task force defined a common data set for submitting student records to colleges and universities. (63)

National Center for Education Statistics (NCES) Interstate Student Records Transfer System (K-12 and post-secondary): Florida, California, New York, Texas, and Washington schools will

begin transmitting student records to each other in the fall of 1990 as part of a voluntary pilot effort. Information will be downloaded to PC's and transmitted via an interstate telecommunications network called GEIS. The process will be reversed at the receiving end. In addition, Florida is planning to electronically relay common core data elements to NCES.

On the post-secondary level, a similar pilot will transfer student information between Purdue, University of Texas, Georgia State University, and Queens College. As on the K-12 level, the objective of this exercise is to develop common national standards for student records transfer.

Final objectives of the project are to translate identified data elements into American National Standards Institute formats, complete network specifications, determine governing responsibilities for the system, and expand the pilot participation. (79,94)

APPENDIX E
DATA ELEMENTS OF STATE-LEVEL STUDENT INFORMATION SYSTEMS

Demographic Information	name, nickname, mailing address, residence address, resident status (county, state, country), sex, ethnicity, date of birth,student identification number, grade level, birthdate verification, birthplace, social security number, migrant status
Family Information	language used in home, parent education, parent occupation, parent attitude towards education, number of siblings, marital status, number of dependents, dependency status
Financial Information	family income, number of dependents, student income, loans, degree of loan indebtedness, grants
Institution Information	institution name, number, address, current enrollment, facility type (residential, correctional, etc), term number, fiscal year, school year, length of instructional day and year, class size
Course Information	course number, title, flag (honors, remedial,etc), section number, period number, grade, days in term, teacher certificate number of credits earned and attempted by term and cumulative, GPA, track or major, changes in major, basis of admission, unit load, full/part time status,
Completion Information	certificate of completion date and type (regular, special, etc), entry/re-entry (code, date), withdrawal (code, date, reason), expelled from school, high school of origin, last institution attended, graduation date
Test Information	name, date, subject, form, level, score, score type (raw, percentile, etc), use
Vocational Information	program code, program length, special student characteristics (single parent, disadvantaged), termination codes (completer, leaver, in-school, remain in program), other categories (JTPA, apprentice, co-op), hours of instruction, facility type, competency tests/basic skills
Special Program Information	handicapped student type, limited English proficiency, learning disabled
Employment Information	length of employment, current occupation, placed in area trained (vocational students), hours per week, availability for employment, job satisfaction, # months unemployed, hourly wage, hiring level, median annual income, perception of adequacy of vocational program (guidance, other), relationship between coursework and actual job experience, preferred employment, career goals, employer satisfaction
Miscellaneous Information	extracurricular activities, honors/awards, educational goals, degree aspirations, skills (test taking, study, higher order thinking, general education), self-esteem, perception of education experience, subject matter attitude (math/science), reasons for dropping out, health records (immunization dates)

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Vince Madden, California Department of Education
Henry Boas, Deputy Director, Los Angeles Unified School District
un-named staff member of California Post-secondary Commission
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Sharon Sampson, Colorado Commission on Higher Education
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David Cleaver, Connecticut Department of Education
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Department of Education Student Information systems personnel: Linda Haragonna, Linda McDaniel, Bob Friedman, Donna Miller
Community Colleges: Harry Rudy
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Florida Education Training and Placement Program: Dwayne Whitfield, Jay Pfeiffer.
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Dick Grove, Georgia Department of Education Vocational Education Division
Nancy Mier, Georgia Department of Education
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Michael Heim, Administrator of the Evaluation Section in the Superintendent's Office, Department of Education, State of Hawaii
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Connie Wise, Department of Research State Board of Education
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H.M. Snodgrass, Department of Education
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James Callahan, Maryland Governor's Employment and Training council
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Dr. Mora, Assistant Director of Research, University of Michigan
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Mark Manning Department of Education Data Systems
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Al Lund, Missouri Department of Education Vocational Education Division
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Thomas Runkel, North Carolina State Department of Education
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Denis Martin, Associate Director, New York State Education Department, Division of Planning
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Jim Daubenmire, Ohio Department of Education.
I.A. Ghazalah, Professor of Economics, Ohio University
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Zoe Linegrouper, Oklahoma Department of Education, Research Evaluation and Student Testing
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David Allen, State of Oregon, Employment division
Sue Violette, State of Oregon, Employment division
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Jerry Hottinger, Department of Education
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Ron Jordan, Supervisor Research Coordinating Unit, South Carolina Department of Education,
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Dennis Hirsch, Department of Education
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Karen Courtwell and George McCullough, Texas Education Agency
Dr. Glynn Ligon, Austin Unified School District, Austin, Texas
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George Brown, Utah Department of Education
Rita Oram, Utah SOICC
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Nancy Alar, Wisconsin Vocational Technical Adult Education Department
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*Additional interviews were conducted by Morrison staff, but were not used for the purposes of this document.